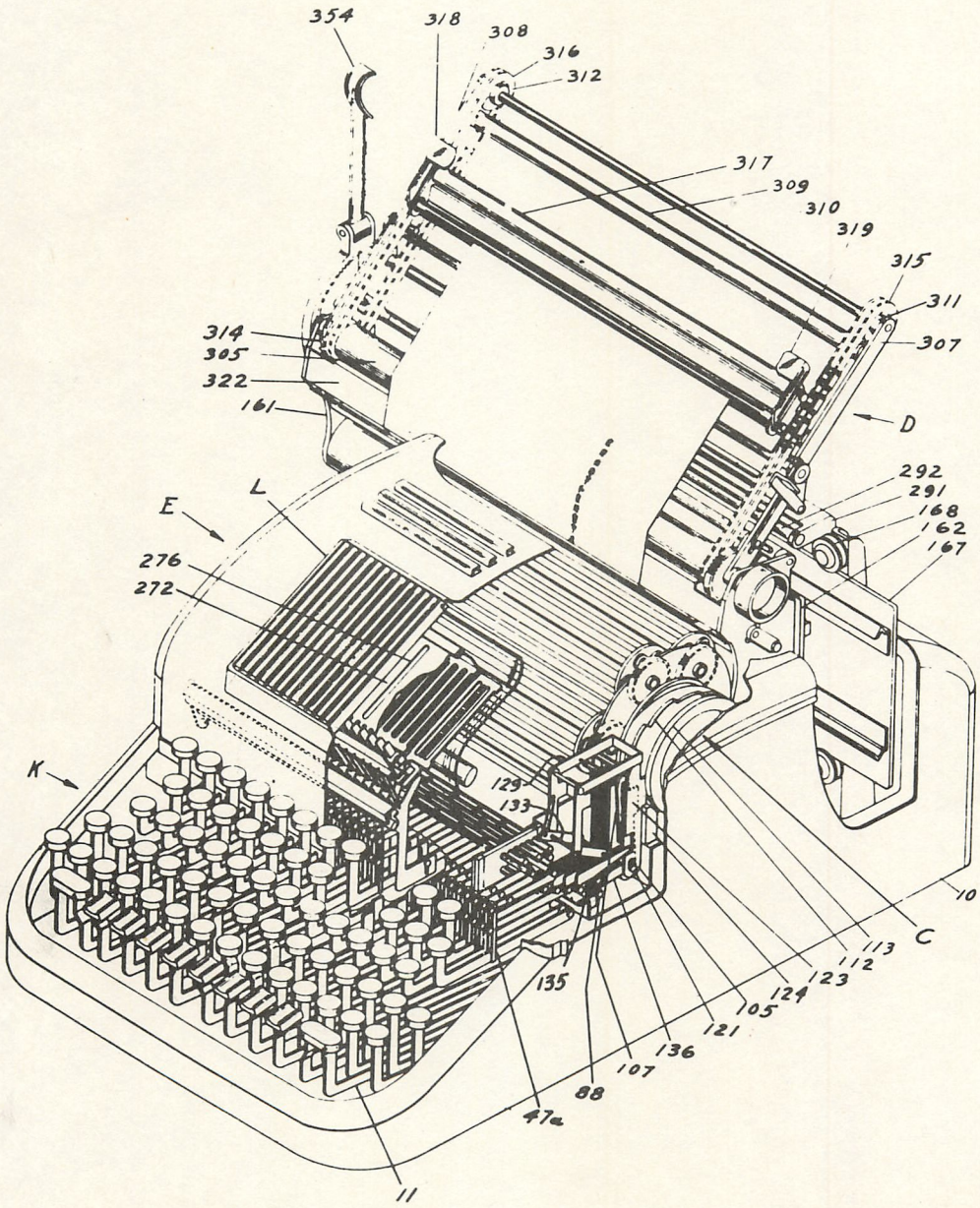
CASE STUDY.....CHINESE TYPEWRITER



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CASE STUDY - CHINESE TYPEWRITER

The complexity of modern society requires communication between person and person, business and business, office and office, and so on. In the Western world, machines such as typewriters, teletypes, type-setting devices, and the like have been invented to meet the need. Typewriters become a necessary tool for many professions and persons and standard equipment for any type of office. Type-setting devices make newspaper and book publishing a comparatively high speed operation.

Such is not the case in China. For centuries, copy writers have been employed to do most of these chores by long-hand with brushes and ink. Even for large volume publishing, manuscripts are copied by long-hand and type boards are set up by trained hands, picking lugs from shelves that occupy no less space than a medium-size room. The limit on speed for such process can well be imagined.

Devices for printing Chinese characters have long been studied by many designers. But the great number of characters that are related to each other in no simple manner yet are required for correspondence or adequate written transmission of the Chinese language has made it difficult to design such devices. The principal reason for the failure is the impossibility of providing enough types to print all the characters required for the language and at the same time of providing a simple, quick, and reliable means for selecting the desired characters and components.

To give an idea of the size of the Chinese vocabulary, the Kang-Hsi Dictionary lists about forty-three thousand characters. Modern student dictionaries contain from ten thousand to fifteen thousand words. Survey estimates the minimum number of words for ordinary commercial use to be more than twenty-three hundred. The present classifications or arrangements of the characters are arbitrary and unsatisfactory. Inasmuch as the Chinese characters are so complex, a simple and logical classification system has not been found.

Typing boards have been in use for many years, but they do not compete with copy-writers because of their slow speed. In recent years several noteworthy proposed designs for typewriters have been disclosed. These schemes have certainly taken long strides towards realization of a more satisfactory device. However, there is ample room for ingenuity either on the method of arrangement of the characters or on the mechanical construction of such devices.

As far as other printing machines and the like are concerned, comparatively little has been done to date.

The Chinese Language is one of the only pure languages surviving the branding force of time. The written language consists of individual words called characters (字). The characters are monosyllabic and pictographic ideograms; standing alone, each ideogram can convey to the mind an isolated picture. A character comprises three basic elements --- thought, sound, and form. In order to understand the Chinese language one must have a clear insight into the structures of these characters and be able to write them in the correct order of strokes.

The first standard work on the Chinese etymology (說文解字) was done by a scholar named Hsii Shen (許愼); which was not printed until 120 A.D. He first divided all the characters into two classes: simple figures (文) and compounds (字). He then synthesized the entire language under six headings. For simple figures, there were Pictographs (象形) --- imitative symbols that imitated the appearances of things, and Indicatographs (指事) --- indicative symbols that expressed an action, quality, or events. For compounds, there were Phonograms (形聲) --- phonetic compounds in which one part stood for the sound or pronunciation while the other stood for the meaning, and Ideograms (會意) --- logical combinations in which each part of the character contributed to the meaning of the whole. These formed the basic elements in the derivations of characters. From these elements, elaborations of characters such as Extensographs (轉注) and Borrowed words (假借) developed. A great majority of the Chinese characters were shown to be compounds of two elements: radicals, indicative of meaning, and phonetics, indicative of pronunciation. These elements, then, may be considered as the molecules of the characters. Examples of the six headings are illustrated in Table I.

Although the Chinese language has no alphabet, a hint to its counterpart may be found in the strokes. These strokes that make up each character constitute its atomic structure, in the same sense as the alphabet in the English language. There are six fundamental stroke movements in the Chinese language;

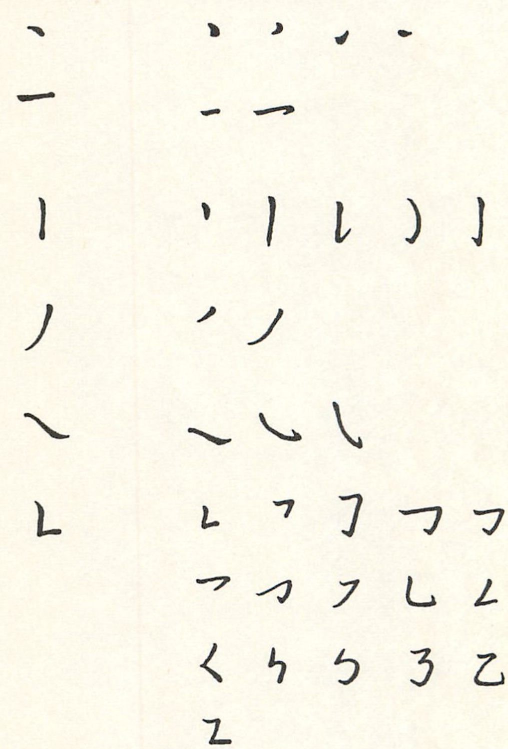
TABLE I ETYMOLOGY

PICTOGRAPHS 象形	日	(sun)	
	月	(moon)	
	山	(mountain)	
	水	(water)	
	木	(wood)	
INDICATOGRAPHS 指事	大	(large)	 a man stretching out.
	上	(above)	from the radical 一 (one or the great divide); on top of it is above and under is below.
	下	(below)	
	二	(two)	number of matters present.
	三	(three)	
PHONOGRAMS 形聲	凍	(freeze)	冫 means ice and 東 indicates sound.
	洋	(ocean)	氵 means water and 羊 indicates sound.
	說	(speak)	言 means words and 兌 indicates sound.
	味	(taste)	口 means mouth and 未 indicates sound.
IDEOGRAMS 會意	東	(east)	the sun rising through the woods.
	天	(sky)	above the earth and all.
	本	(root)	below the tree.
	末	(tip)	on top of the tree.
EXTENSOGRAPHS 轉注	原	(source)	extented from 泉 which means water origin.
	考	(test)	extented from 老 which means old or aged.
BORROW WORDS 假借	物	(matter)	牜 is a variation of 牛 which means a cow; borrow cow to represent matter. 勿 indicates sound.
	群	(crowd)	from sheep 羊 who stay in groups. 君 indicates sound.

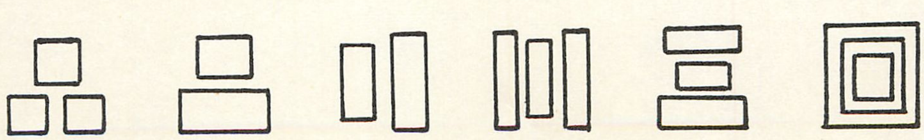
from these are derived thirty-eight basic strokes. These strokes can be identified in all the characters. These strokes are shown in Table II:

Table II, Basic Strokes

Stroke movement	Fundamental	Variations
1. Dot (點)		
2. Horizontal (横)		
3. Vertical (豎)		
4. Downstroke to the left (撇)		
5. Downstroke to the right (捺)		
6. Angle (角)		



The basic form of a character is a square. Strokes are located within an imaginery square to constitute a sense of symmetrical or asymmetrical balance. Thus, these strokes are found to be of different sizes, depending on their locations in the square. A simple figure occupies the whole square. In compounds, elements are put together in various ways. Common forms are shown as follows:



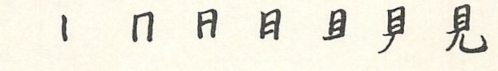
The order of writing the strokes of a character seems to always follow a sequence pattern. A standard sequence in writing each character, similar to the spelling of the English words, has been unconsciously established for reasons unknown. Five general rules can be written down as a guide in writing:

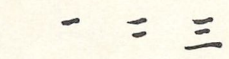
Rule 1. From top to bottom.
Rule 2. From left to right.
Rule 3. From outside to inside.
Rule 4. Horizontals and rectangles before verticals.
Rule 5. Downstrokes to the left before downstroke to the right.

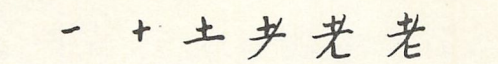
Illustrations of these rules are shown in Table III.

Table III

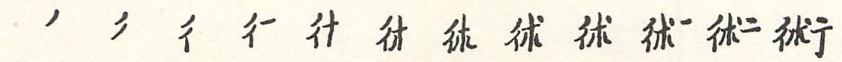
Rule 1. From top to bottom:


(to see)


(numeral three)


(old or aged)

Rule 2. From left to right.


(skill)

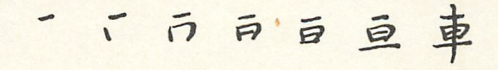

(stream)

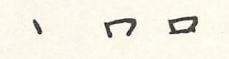
Rule 3. From outside to inside:


(mother)


(prisoner)

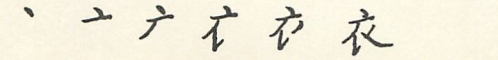
Rule 4. Horizontals and rectangles before verticals:


(vehicle)


(middle)

Rule 5. Downstrokes to the left before downstrokes to the right:


(human)


(dress)

Notice that a character is usually complicated enough to require application of a combination of these rules. In case where there are conflicts among rules the order as given governs.

Scholars believe that such standard sequence in writing is inherent in the nature of the language and in the art of calligraphy. The rules in writing are taught in schools. However, unlike English words, a mispelling in the sense that standard sequence of strokes in writing a character is not followed does not alter the ultimate appearance of the character. To a layman such strict procedures seem unimportant and writing sequence many times is developed through habits. Nevertheless, except for ambiguous details, the above rules are generally followed.

Owing to the vast number of individual characters in the language the need for a rational method of classification, primarily for the purpose of library cataloguing and dictionary indexing, was realized early in the Chinese history. A system derived from the work of Hsii Shen was based on roots named radicals. The original number of radicals was five hundred and forty. Through the years, simplifications were made. At the end of the seventeenth century, the May's Chinese Dictionary (梅氏字彙) and the more well-known Kang-Hsi Dictionary (康熙字典), named after a famous emperor of the Ching Dynasty, reduced the number to two hundred and fourteen. The Radical system dominated the Chinese classification work till the turn of the century.

Due to the constraint of the Classics called "the Six Books" and the influence of the Kang-Hsi Dictionary, Chinese scholars failed to realize the urgent need of a better system. It was the foreign scholars who were interested in the Chinese civilization that felt this need. Ironically enough, it were they that reopened the frontier of index study and plunged forth with such well-devised systems such as Rosenberg's Five-Last Stroke system and Poletti's Bi-radical system. In 1929, thirty-seven new methods were on record. But by 1933 the number boomed to seventy-seven. The new methods were in general based on one or more of the inherent characteristics of the language. The different principles are outlined as follows:

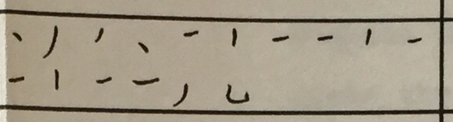
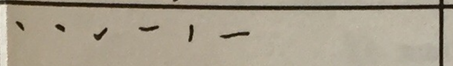
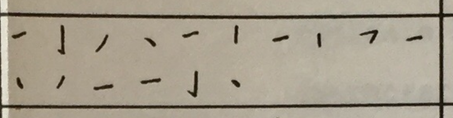
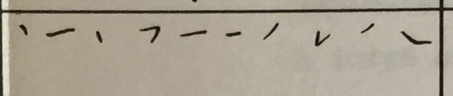
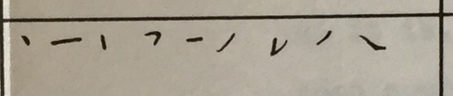
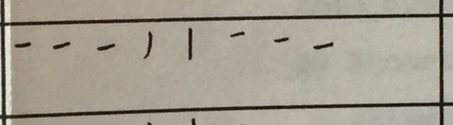
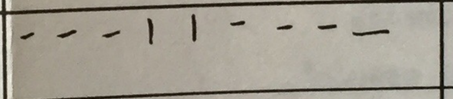
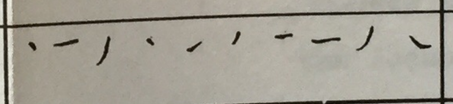
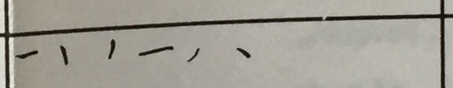
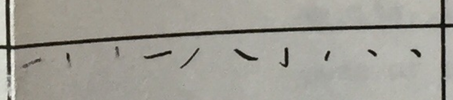
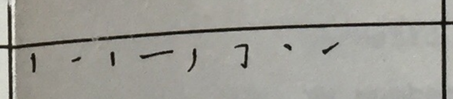
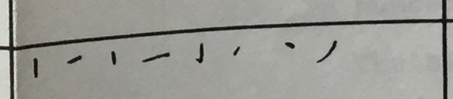
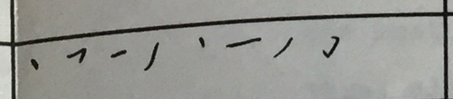
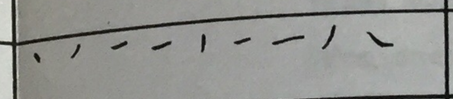
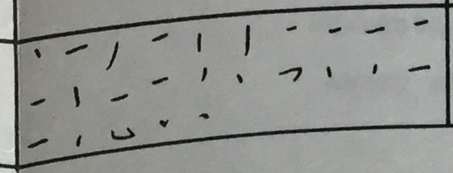
I. Phonetics-- invention of forty phonetic alphabets.

II. Forms--

1. Radicals
2. Order of strokes
3. Number of strokes
4. Numerical-- arbitrary coding by numerical systems.

Each of these methods represents a long research and well thought out scheme. Each has its merits and shortcomings. But due to the complexity and unusual nature of the Chinese language, none is considered by all as logical and satisfactory. Discussion of the relative merits will not be presented here. Since a coding system is essential to the development of a typewriter and the like, methods that offer possibilities as coding systems are described briefly in the following. Examples are referred to Table IV.

TABLE IV

NO.	CHARACTERS	RADICALS SYSTEM		STROKE NUMBER	STROKE SEQUENCE	NUMERICAL SYSTEM		LIN'S SYSTEM OF CONFIGURATION	
		RADICAL CLASS	STROKE CLASS			4-DIGIT CODE	4-CORNER SYSTEM	TOP	BOTTOM
1	燒 (to burn)	火 (fire)	12	16		3543	9481.1	丶	儿
2	江 (river)	水 (water)	3	6		0262	3111.0	丶	一
3	樹 (tree)	木 (wood)	12	16		0974	4490.0	木	寸
4	衰 (to weaken)	衣 (cloth)	4	10		2121	0073.2	亠	仄
5	哀 (lament)	口 (mouth)	6	9		1720	0073.2	亠	仄
6	非 (not)	非 (not)	0	8		0440	1111.1	十	一
7	韭 (leek)	韭 (leek)	0	9		1905	1110.1	十	一
8	疾 (disease)	疒 (sickness)	5	10		2059	0013.4	疒	人
9	共 (together)	八 (eight)	4	6		0231	4480.1	廿	八
10	恭 (respectful)	心 (heart)	6	10		1983	4433.8	廿	心
11	肯 (willing)	肉 (flesh)	4	8		0427	2122.7	卜	月
12	步 (step)	止 (stop)	4	8		0324	2120.1	卜	丶
13	房 (room)	户 (door)	4	8		0400	3022.7	户	力
14	美 (beauty)	羊 (sheep)	3	9		0506	8043.0	丷	人
15	廳 (hall)	广 (cover)	22	25		1102	0023.1	广	心

I. By Radicals:(部首法)

All characters are classified under two hundred and fourteen radicals. Under each class of radicals, characters are grouped by the number of additional strokes, besides those that form the radical, necessary to complete the character.

It must be noted that the two hundred and fourteen radicals have no natural sequence and the number of characters under each stroke group may easily run up to a large number. For high speed typewriting this system, as it is, is not practical. However, it does form a good source for derivation of possibly improved systems.

II. By Phonetic alphabets: (聲韻法)

Attempts to standardize phonetic pronunciation of the Chinese language were officially experimented with before the Second World War. Forty phonetic alphabets were adopted. Although there was not enough time to prove its merits, it offered a very good possibility for the purpose of typewriters and the like, provided a standard phonetic spelling can be recognized and standardized.

III. By number of strokes: (筆數法)

The simplest Chinese character has one stroke while the most complex one has as many as thirty-eight strokes. Thus, all the characters may be arranged into classes of from one to thirty-eight strokes. Of course, most of the characters fall into classes between three strokes and twenty strokes.

Again duplications under some stroke class are too large in number. Therefore, the system, as it is, is not adequate for the purpose of a typewriter. Furthermore, counting the number of strokes of each character before typing is not ideal for high speed typing.

IV. By Order of strokes: (筆畫法)

One of this class of methods is the First-stroke system (江山千古) in which all characters are classified into four class of first strokes (丶, 丨, 丿, and 一). The system is based on the unwritten laws of stroke sequences mentioned in the earlier pages. Strokes are classified by the afore-mentioned thirty-eight basic strokes.

The major disadvantage of this method is the fact that it requires an uneven number of strokes to distinguish words without duplication. With the present day development in electronic swithcing circuits, this system offers the brightest possibility for electronic devices. However, since the number of the commonly used words is about twenty-three hundred this system might be good for a mechanical typewriter also.

V. By numerical codes: (號碼法)

1. The Four-digit code:

This code is adopted by the Chinese telegraph system. Combination of four digits gives a maximum space for just under ten thousand characters. A typewriter was invented by Kao Chung-Chin based on

this code; which will be described in the following pages.

2. The Four-corner system: (四角號碼)

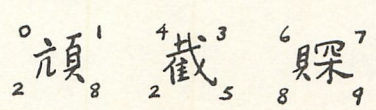
The system was first published in 1926 by its inventor, Wong Yun-Wu, Editor-in-chief of the Commercial Press, Ltd. of China. It was the first attempt to analyze a character purely on its appearance. The principle was to observe part of a character instead of the whole and to consider the quality of strokes instead of the quantity. By properly noticing the four corner strokes, a character is translated into a numerical code. The major advantage is that it enables a layman or even a foreigner who has no understanding of the language to locate a character by visual observation and an understanding of the following rules of the system:

Rule I: Ten classes of corner strokes are defined arbitrarily in Table V.

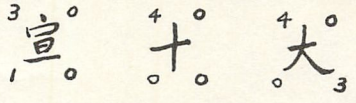
Rule II: Strokes or part of a stroke on the four corners are in the following order:

1. the upper left corner
2. the upper right corner
3. the lower left corner
4. the lower right corner.

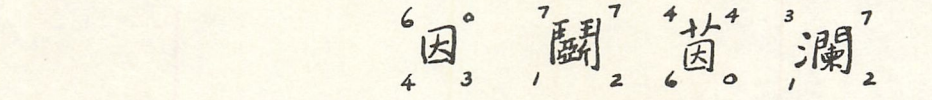
For example:



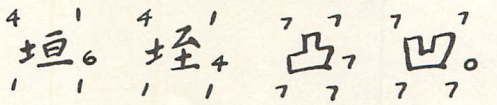
Rule III: Whenever the upper or lower part of a character has only one stroke, that stroke whatever be its position is taken for the left corner, while the right corner is represented by a zero. If part of a stroke has been taken as a corner, any other part of the same stroke taken as another corner shall be represented by a zero. For example:



Rule IV: When there are no other strokes to the four corners of such radicals as 門 口 閂 , the strokes inside these radicals shall be taken to represent the lower corners. For example:



Rule V: Characters whose four corners are exactly the same may be subdivided by a supplementary corner which shall be the stroke just above the lower right corner and whose end shall be covered by no other stroke. For example:



4111.6 4111.4 7777.7 7777.0

When a standard printed form is used, five numbers, representing the four corners and the supplementary corner, are enough to differentiate the several thousand commonly used words. It represents a good possibility as a coding system for typewriters and the like. For more details of this system, reference to the bibliography is advised.

Typing machines for the Chinese language, one kind or another, had been in existence for many years. It is more of a typing board rather than the completely mechanized version of the Western typewriter. Various models produced by different manufacturers, including the Chinese as well as the Japanese, are similar in operating principle. The major deviations lie in the arrangements of the character lugs on the type board. A typical arrangement of 2380 character lugs on a lug board is shown by the chart in Figure 1.

A typical model of this kind is shown in Figure 2. It is a recent A-L model of the "Universal Chinese Typewriter" produced by the Nippon Typewriter Company, Ltd. in Japan in 1952. The typing mechanism comprises a typing arm, on which a holder for a character lug is attached, an inking device, a pickup pointer, and a control bar knob. The entire mechanism rides on a carriage which has freedom of movement forwards and backwards along the side rails of the base. The typing mechanism is also capable of horizontal side-to-side movement on the carriage. This freedom of movement enables the operator to locate proper lugs anywhere on the lug board. The lug board is a tray with slots to hold

◀表位字機字打文中▶

部人兄弟晚生甥小號兒最戲家舍校公司
YZ$φ&£@#%/ +—×÷=
HIJKLMNOPQRSTUVWX
1 2 3 4 5 6 7 8 9 0 A B C D E F G
黑默黛蘭眼鼎鼓鼠鼻齋齒齡龍鸛龜龠蘇
鴿鷲鵬鵝鷄鷹鹵鹹鹽鹼鹿麒麓麵麻麾黏
鬼魂魄魏魔魯鮑鮮錢鯊鱸鱷鳥鳴鴛鴦鴨
騷騙騫驗驛骨骯髒髦髣髮鬚鬥鬱鬯
馥馨馳駕駐駒駛駟駭駱駿騎騙騫騰
飽飾餐餃餞餞餅餡餚餽餾饋饌饑
領類頸頻頗頤頦顆顧顛顢飢飲飭飯飼
章韌韓韞韶韻響頁頂頃項頑頗頓頗
霜霞霧露霸靈霹靜靠靡靴靼鞋鞍鞘鞭
雁雄雅集雌雕雙雜雞離雨雪雷需震霏霖
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銓鎢鋒鋤鋅鋸鋼錐錄錦錫錯鍋鍊鍛鍰
釘針鈞鈎鈔鈕鈑鉛銅鉑銜銳銻銷銹
配酬酷酸酵酷醒醇醜醫釆釋里重野量釵
邀邁還邊那邦郊郎郭郵鄉鄙鄧鄭鄰酉酌
遂遇遊運遍達遙遞違適遣遭遐遵避遷遺
追逆退通透逐途逕逢這速造逝連遇逸逾
辜辣辨辭辯辰辱農迅迎返迫述迥迷逃送
軌軒軟軸較輔輕輛輝輩輯輸轄轉轍轟辛
趙趣跌跋跑跟跡距跳踏踢踐踴躬躯
蝦蝴蝶蝸蝿蝙蝗蝕蝨蝠蝟蝣蝦蝴蝶蝸
賢賜賞賠賣賢賤賦質賬賭
貽資賈賊賒賑賓賜賞賠賣賢賤賦質賬賭
負財貢貧販貪貯貫責買貸貼貿賀貳貶貴
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誘誦誠誤誨誰課誼調諄談諒諦諜諱諷
託訟訪訴註評詞詠詢試詭詳詩誌誥認誓
雙視覆覇覊規覓視親覺覽觥訂訊討
哀衷袂袋袖袍裂裁裡裏裕裝褂褒複褲襪
蜜蝕蝦蝶融蝨蟹蟻蠅蠶衍衰衷衝衡衝衫衰
新薯藉藍藏藝蘇蘭虎虛虞虧虫蚊蚜蜀蜂
童莉葱葵葦蒜蒞蒸蓬蘇蓮蔡蔣蔬薇薇瀆薄
舞舟航般艇艦艘艙艦艷芝芬芳苑茨苛苟苞茂
脈膏膚膳膾臉膽臥臨臭致臺臭舌舍舒舜
肥肩肯育肺背胃胡胞胸腕脚脫腐腦腰腿
耗聆耿聊聖聘聚聰聽聾肅肇肉肖肝肚
置罷羊羞美翅翁習翔翠翳翹翼翻考耐耑
綢練緻縫縱績繁織繕繡繼續缺罄罐罪罰
銹綠網綱綸緊緋緘結絕絞給絮統絲絹綁
紫細累紹終組絡絨結紀紋納紐紗純級紛素索紡紮
糞槳糙糧系
簽簫簣簿籍籌籠籤粉粒粗粟粥糕糖糜糟糠
筋筒答筷策筲筆管箕箸範篇築篤篾簡簫
窮窕窺竊站竟竣童竭端競竹笑笠符筆筒
稱稻稽稼稿穆穀穌積穗穩穴穿突窄窗窘
祿禍禦禧禱禹禽秀私秉秋秒租秘秩移稚
碰碟碧碼磁磅磊磚磨礎礙礦祇祖祝祭
睹睿短矮矽砵砲破研硬硯硃碎碑碗
盟盤監盡直盼眉看眞眠眷眸眼着睛睡睦
瞧瘋瘦瘡瘧瘠瘢瘤瘟瘓癸登皇皮盆盈盒盜盡
痴痲瘋瘦瘡瘧癸登皇皮盆盈盒盜盡
環瓜瓦瓷瓶甄甘甜甥產甫田甲申男畏
畜畢略番疋疆疏疑疲疾痊痕痘痢瘓
基堂堅堯報場士外多夜大天太夫失奏奉
喜喪單嚴四回因國圍在地均坐坡城埠執
向君否吳吾告呂周命和哉員唐商問啓善
友取受口古只可台史右司各合同名后吏
區十千廿午卅半南卸卽卿厘原去又反及
劉力功加助勘動務協勞勢勤勿包化北匪
公六共兵其再決凡出分列初別利到則前
信個修候傳價元兄先光免兒入內全兩八
令以件份任伯但似位何使來例便係俄保
事二于云五亞亡交亦京人仁今他仙仟代
一七三上下不且世並中丸乃之乎九也亂
枚枝架柴根格桂桌梅梯棉椅椎楊楷椒概
暴遲曆曙曲替最朋木末札束材村杯板枕
旋族旗旨早旬昇易昔晚景普智暇暗暢暫
放效敏敗敵敢教敲敷整料斤斧斷旁施旅
指捉捷掃授排掛採推損提揚換握揭揮援
抄把抑投抗批抱抵押抽担拍拔招持拿技
忍志忘忙快念忽怎怕怡性怪慫恆恐恕恙
延建弄弊式弟弱強彎彩影役待很徵徹徹
帽幣幫幸幹幾序底度庭庶康廉廚廟廠廢
寄密寒富寓審寫寬封射尋導尖尤尾居屆
屋展履層屢岸崇巧巨差巳巾希帚帮帳帶
姑威婚媽嫌嬰孟季孩孫宋完宏宗宥宴寧
够夏夢央夾奇套奪奬奮奶奸妙妥妹姊娛
址坊埋域垂堤塊堪境塵增墨壓壞壯壺壽
品哀响哈咬哥嘱嘆嘉嘗器嘗嘯哲
哭啡唁唇售唯唱啊喉喝嗎嘉膏器嘗嘯哲
另叫吃吐含吧吩呈吸吵吹吻呀呢味呼咐
卒協博卜印危卸厚歷參叔叙疊叢句叨
剛剩剪副創割劇劈劍劣努募勤匆匯匹升
兄冷准凰凱凹凸函刀切刑判制券刷刻刺
允充兆兜克兌俞具典兼冊冒冗冠冥冬冰
健側偶偷傑傘備傢債傷僑僞儉儀優儲
俯俱倏們倒倘倚倡借倣値倫倂假偉做停
作余佩佳併供依侮俟侵侶促佔俗佣倉倍
亭亮介什仍仇付仰伏伐休你伴佈低住伸
丁丈丑丙丹主久乏乘乙乾了予互井些亥
點齊黨龍壹弐參肆伍陸柒捌玖拾佰
館首香馬馮體高魚鳳鴻鶴麗蠻麥麼黃黎
零雲電青非面革音順須頭願風飛食養餘
銀錢鐘鐵長門開閣關防附院陳隆隊雖難
車載軍輪辦近進過道遠選邑部都酒醫金
論謂講謝謹警議豈豐貨貴費起足路身
見覺角解言計記設許詩話該誠語說請諸
蒙蓋藥處號蛇血衆行街衣表被補製西要
臣自至與興舉舊舖船良色花若苦英華萬
羅美羣義翰耀老者而耳耶聞聯聲職殺能
等算箱節籃米粵精約紅紙經維繩縣鳴署
祈神祥票稟禁福禮科稅程種究空立章第
發白百的皆益盛盧目相省督矢知石示社
猶獲王現理甚生用由界畧異畫當症病痛
消涉清港源滿漢火烟焉無然照爲牌特物
毫民氣水永求汕江沙油治泉法泰洋派海
極榮樂樓權次歎欲止正此死殺毋每毒比
服望朝期未本李東果林某查校案梁條業
於既日昌明星春昨是時曰更書曾會月有
控據擬支收改政故教救散敬數文斯新方
應成我或戰所手才打承拜按振捐捕探接
從復德心必忠思急息患情惟愈想意愛憲
常平年庄店府廣廷張憚形彼往律後徒得
尚就尺局屬山川州工左巳巴市布帝席帥
宜客宮宣害家容察實寸將專尊對小少
女好如妻始姓委婦子字存孝學守安官定
基堂堅堯報場士外多夜大天太夫失奏奉
喜喪單嚴四回因國圍在地均坐坡城埠執
向君否吳吾告呂周命和哉員唐商問啓善
友取受口古只可台史右司各合同名后吏
區十千廿午卅半南卸卽卿厘原去又反及
劉力功加助勘動務協勞勢勤勿包化北匪
公六共兵其再決凡出分列初別利到則前
信個修候傳價元兄先光免兒入內全兩八
令以件份任伯但似位何使來例便係俄保
事二于云五亞亡交亦京人仁今他仙仟代
一七三上下不且世並中丸乃之乎九也亂

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70

◀製編司公限有字鑄文博▶

Fig. 1

注附

（一）之女工員，最為勝任也。

（二）本盤位之放置，乃採用印刷字盤之排字方法，以便打字技員之易於練習而產生，故凡我們辦至於本表未有輸入而借用之字者，特置預備盤，其放置法，可請自行按字部之前後數入使用。

（三）由一至七十行位，再將續城放在盤盤之後（上）部

（乙）入俗字者燒，放在盤盤之前（下）部，由四十一至七十行位，再將續城放在盤盤之後（上）部

特別應用字之活動放置）

（甲）出俗字，放在盤盤之前（下）部，佔一至三十八行位，（三十九至四十行，之二空行為準備

特其各該字之放置如表：

，乃佔用度百份之四十強，而其餘一千七百四十六百餘枚，編置成盤，再將盤二千三百餘之常用字中，分為出入二俗，其出俗字數為六百四十枚

本機用字，疊經專用員從各方面統計，調查商業上普通文章，足供日常用度之字數，約二千三

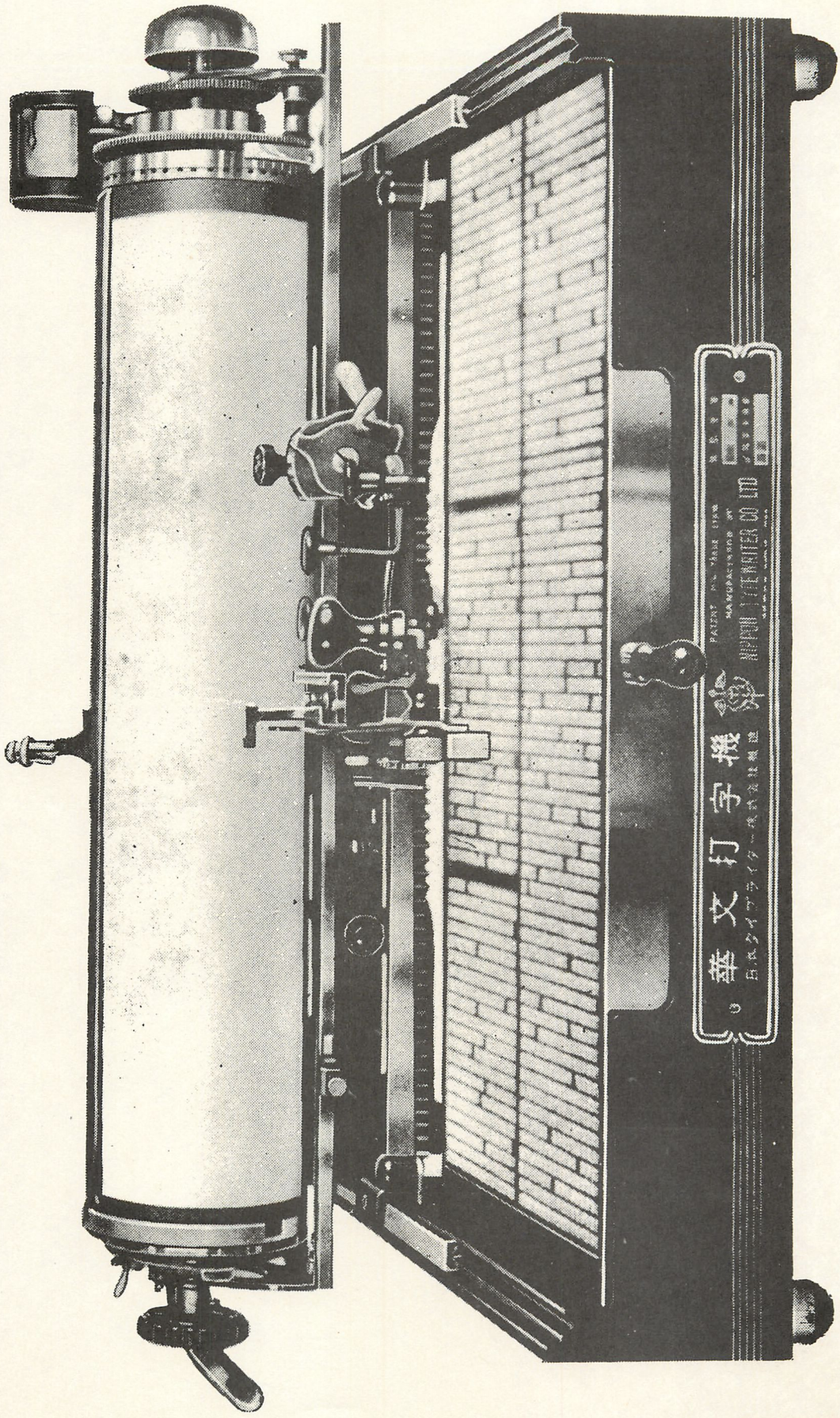


Fig. 2

4000 character lugs. A lug is a steel type of 1/4" square cross-section and 1-1/4" long with a character molded on one end. The slots have an opening at the bottom so that a pickup pointer is used to push the lug out. The paper roller and its entire mechanism are attached to the carriage with the typing mechanism. The paper mechanism is similar to that of a standard English typewriter, except for the fact that the indexing device can be adjusted for typing horizontally or vertically.

The operator, holding the control bar knob, moves the carriage to locate the character lug. When the proper lug is located, the control bar knob starts off the impression process. As the knob is depressed, the following steps occur in sequence: the pickup pointer pushes the lug out of the slot; the holder engages the lug; and the typing arm swings the lug up and against the paper to make the impression, the lug being inked by the inking device along the way. After the impression is made, the control bar knob is released and the typing arm falls back and returns the lug back to the slot. At the same time the control bar sets off the index mechanism to displace the paper one letter space. The process of typing one character is completed. The process is slow as its speed depends on how fast the operator can locate the wanted lug among the 4000 lugs. The manufacturer claims that an experienced operator can attain a speed of over three thousand words an hour. Carbon copies can be made up to 15 copies. The important feature is that the index mechanism can be adjusted for typing horizontally from left to right or from right to left as well as vertically from top to bottom.

In recent years, several proposals for improved coding systems as well as for an improved design of a typewriter were disclosed. Some of these are found among the U. S. patents. Of these, two of the most recent ones deserve more attention. They are inventions by Chung-Chin Kao and by Lin Yutang.

Chung-Chin Kao's Chinese Language Typewriter

This is probably the first completely mechanized typewriter for the Chinese language. The typewriter, first produced to type 6000 Chinese characters, is capable of typing a maximum of 10,000 characters. The few existing units provide a collection of 5378 common characters, and 100 commonly used symbols, and the English Alphabet and numerals. The entire body of the Chinese characters is divided into three sections of; 1000 most frequently used words, 3096 less frequently used words, and 1182 sparingly used words. The frequency distribution of occurrence of these three sections in daily use is given in Figure 3a.

Selection of characters is based on a numerical system in which an arbitrary four-digit code is assigned to each character. The numbers between 0000 to 0999 are assigned to the 1000 most used words. (See Figure 3b.) The four-digit code is similar to the system mentioned earlier; thus, it is not entirely unknown to the public. However, it does require that the operator memorize the code for at least the most frequently used words and to refer to a key to the code from time to time. The typing process can be quite laborious.

Figure 4 shows a schematic view of the machine. The principal construction features are given in Figures 5 and 6. The

STATISTIC STUDY

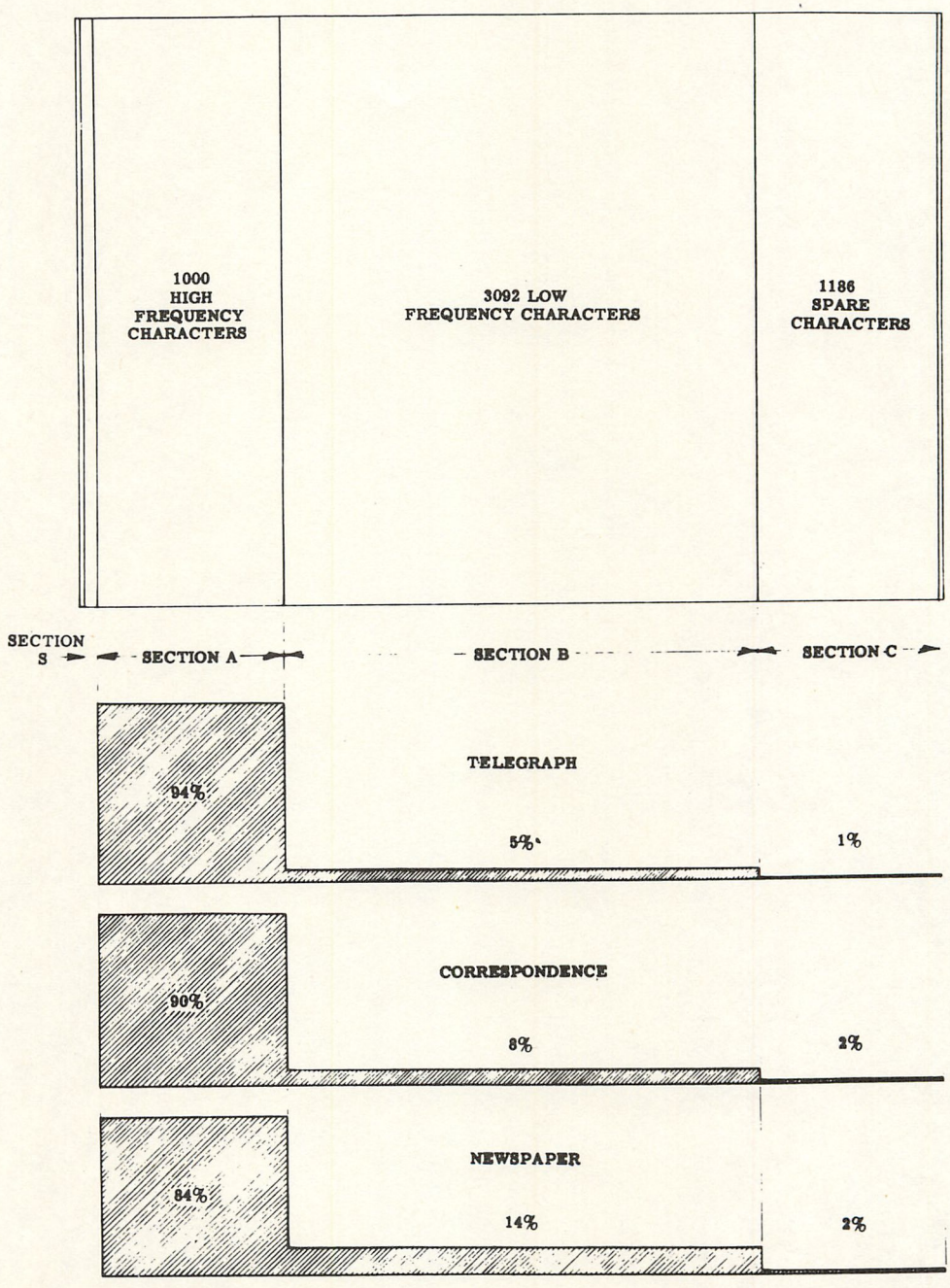
OF

THE FREQUENCY OF CHARACTERS

IN DIFFERENT SECTIONS

WITH RESPECT TO

3 MAIN FIELDS OF LITERATURE



This specific arrangement of Chinese characters enables the machine to be operated at high speed (40 to 50 characters per minute), also, facilitates the training of operators so that only those characters in Section A are required to be memorized. An operator, after studying the Instruction book for two months, will be able to operate the typewriter at a speed of 20 words per minute and become experienced within 4 months to reach maximum speed.

Fig. 3a

	1 - 2	一 0100	七 0101	九 0102	了 0103	二 0104	人 0105	入 0106	八 0107	力 0108	十 0109	又 0110	3	三 0111	上 0112	下 0113					
久 0114	也 0115	凡 0116	千 0117	口 0118	土 0119	士 0120	大 0121	女 0122	子 0123	寸 0124	小 0125	山 0126	工 0127	己 0128	巳 0129	才 0130	4	不 0131	中 0132		
之 0133	五 0134	互 0135	云 0136	今 0137	仍 0138	什 0139	元 0140	允 0141	内 0142	六 0143	公 0144	分 0145	切 0146	化 0147	午 0148	及 0149	反 0150	友 0151	天 0152	太 0153	夫 0154
少 0155	尤 0156	尺 0157	引 0158	心 0159	手 0160	支 0161	文 0162	方 0163	日 0164	月 0165	木 0166	欠 0167	止 0168	比 0169	水 0170	火 0171	父 0172	5	且 0173		
世 0174	主 0175	乎 0176	令 0177	他 0178	以 0179	付 0180	代 0181	兄 0182	冬 0183	出 0184	加 0185	功 0186	北 0187	半 0188	去 0189	古 0190	可 0191	只 0192	台 0193	司 0194	右 0195
史 0196	叫 0197	四 0198	外 0199	失 0200	央 0201	左 0202	市 0203	平 0204	必 0205	打 0206	未 0207	本 0208	末 0209	正 0210	母 0211	民 0212	永 0213	生 0214	用 0215	田 0216	由 0217
白 0218	目 0219	示 0220	立 0221	6	交 0222	亦 0223	任 0224	件 0225	份 0226	先 0227	光 0228	充 0229	全 0230	共 0231	再 0232	列 0233	危 0234	名 0235	各 0236		
合 0237	同 0238	向 0239	吃 0240	因 0241	回 0242	在 0243	地 0244	多 0245	好 0246	如 0247	字 0248	存 0249	安 0250	州 0251	年 0252	式 0253	忙 0254	成 0255	收 0256	早 0257	有 0258
次 0259	此 0260	死 0261	江 0262	百 0263	米 0264	老 0265	考 0266	而 0267	肉 0268	自 0269	至 0270	色 0271	行 0272	衣 0273	西 0274	7	你 0275	作 0276	但 0277		
何 0278	位 0279	似 0280	住 0281	低 0282	佈 0283	免 0284	兵 0285	況 0286	別 0287	利 0288	初 0289	判 0290	努 0291	助 0292	却 0293	告 0294	否 0295	吾 0296	君 0297	呈 0298	吸 0299
困 0300	坐 0301	均 0302	妥 0303	完 0304	局 0305	希 0306	序 0307	弟 0308	形 0309	志 0310	忘 0311	忍 0312	快 0313	我 0314	找 0315	把 0316	投 0317	技 0318	批 0319	改 0320	更 0321
束 0322	材 0323	步 0324	每 0325	求 0326	決 0327	沒 0328	汽 0329	男 0330	矣 0331	私 0332	究 0333	良 0334	見 0335	角 0336	言 0337	走 0338	足 0339	身 0340	車 0341	那 0342	里 0343
防 0344	8	並 0345	事 0346	些 0347	亞 0348	京 0349	來 0350	使 0351	依 0352	例 0353	供 0354	佳 0355	兒 0356	兩 0357	其 0358	具 0359	函 0360	到 0361	制 0362		
刻 0363	協 0364	受 0365	取 0366	命 0367	周 0368	和 0369	呼 0370	固 0371	夜 0372	奇 0373	奉 0374	妻 0375	委 0376	始 0377	姊 0378	妹 0379	姓 0380	官 0381	定 0382	宗 0383	宜 0384
尙 0385	居 0386	幸 0387	店 0388	底 0389	府 0390	往 0391	彼 0392	念 0393	忽 0394	性 0395	怕 0396	怪 0397	或 0398	所 0399	房 0400	承 0401	招 0402	担 0403	抵 0404	放 0405	於 0406
易 0407	明 0408	朋 0409	服 0410	東 0411	果 0412	林 0413	法 0414	注 0415	河 0416	治 0417	油 0418	爭 0419	物 0420	的 0421	直 0422	知 0423	社 0424	空 0425	育 0426	肯 0427	股 0428
花 0429	表 0430	近 0431	返 0432	迎 0433	金 0434	長 0435	門 0436	附 0437	雨 0438	青 0439	非 0440	9	亮 0441	便 0442	信 0443	保 0444	係 0445	促 0446	前 0447		
則 0448	勉 0449	南 0450	即 0451	厚 0452	品 0453	城 0454	孩 0455	客 0456	室 0457	宣 0458	封 0459	屋 0460	度 0461	建 0462	很 0463	後 0464	待 0465	律 0466	怎 0467	思 0468	急 0469
恨 0470	拾 0471	按 0472	指 0473	持 0474	政 0475	故 0476	施 0477	是 0478	星 0479	春 0480	昨 0481	某 0482	查 0483	架 0484	段 0485	活 0486	洋 0487	派 0488	洗 0489	洽 0490	洲 0491
甚 0492	界 0493	皆 0494	看 0495	省 0496	相 0497	盼 0498	秋 0499	( ) 0500	科 0501	穿 0502	約 0503	紅 0504	紀 0505	美 0506	者 0507	背 0508	若 0509	英 0510	苦 0511	要 0512	計 0513
訂 0514	負 0515	赴 0516	軍 0517	述 0518	迫 0519	重 0520	限 0521	面 0522	革 0523	音 0524	( ) 0525	風 0526	飛 0527	食 0528	首 0529	香 0530	10	乘 0531	們 0532		
個 0533	候 0534	倒 0535	借 0536	值 0537	修 0538	倘 0539	併 0540	俱 0541	兼 0542	准 0543	原 0544	員 0545	夏 0546	家 0547	害 0548	容 0549	( ) 0550	展 0551	差 0552	師 0553	席 0554
座 0555	庭 0556	弱 0557	恐 0558	息 0559	拿 0560	振 0561	效 0562	料 0563	旁 0564	旅 0565	時 0566	書 0567	案 0568	校 0569	根 0570	格 0571	核 0572	殊 0573	氣 0574	( ) 0575	流 0576
海 0577	消 0578	烟 0579	特 0580	留 0581	病 0582	益 0583	眞 0584	破 0585	神 0586	祕 0587	站 0588	笑 0589	索 0590	級 0591	紙 0592	納 0593	缺 0594	能 0595	致 0596	航 0597	般 0598
草 0597	茶 0600	兹 0601	記 0602	託 0603	訓 0604	訊 0605	討 0606	豈 0607	財 0608	起 0609	送 0610	退 0611	追 0612	逃 0613	酒 0614	配 0615	除 0616	院 0617	馬 0618	高 0619	

Fig. 3b

11	做 0620	假 0621	停 0622	健 0623	副 0624	動 0625	務 0626	區 0627	參 0628	問 0629	商 0630	啓 0631	國 0632	基 0633	執 0634	堅 0635	夠 0636	婦 0637	婚 0638	密 0639	
寄 0640	專 0641	將 0642	常 0643	帶 0644	強 0645	張 0646	得 0647	從 0648	悉 0649	情 0650	惟 0651	惜 0652	接 0653	推 0654	教 0655	救 0656	敗 0657	既 0658	晨 0659	晚 0660	望 0661
條 0662	欲 0663	淸 0664	深 0665	淺 0666	現 0667	理 0668	球 0669	產 0670	畢 0671	略 0672	盛 0673	眼 0674	研 0675	票 0676	竟 0677	章 0678	第 0679	細 0680	組 0681	終 0682	習 0683
船 0684	處 0685	術 0686	被 0687	規 0688	許 0689	設 0690	貨 0691	責 0692	這 0693	通 0694	造 0695	連 0696	速 0697	透 0698	逕 0699	途 0700	部 0701	郵 0702	陳 0703	陰 0704	陸 0705
項 0706	魚 0707	麥 0708	12	備 0709	創 0710	勞 0711	勝 0712	喜 0713	單 0714	善 0715	圍 0716	報 0717	場 0718	富 0719	尋 0720	尊 0721	就 0722	幾 0723	復 0724		
惠 0725	惡 0726	提 0727	換 0728	敢 0729	散 0730	普 0731	智 0732	曾 0733	最 0734	期 0735	棄 0736	棉 0737	植 0738	款 0739	減 0740	湖 0741	測 0742	無 0743	然 0744	爲 0745	異 0746
畫 0747	痛 0748	發 0749	登 0750	着 0751	短 0752	程 0753	稅 0754	等 0755	答 0756	筆 0757	給 0758	結 0759	絕 0760	統 0761	絲 0762	華 0763	衆 0764	街 0765	裁 0766	視 0767	訴 0768
評 0769	象 0770	買 0771	費 0772	賀 0773	貴 0774	越 0775	進 0776	週 0777	都 0778	量 0779	鈎 0780	開 0781	間 0782	陽 0783	隊 0784	集 0785	須 0786	項 0787	順 0788	黃 0789	黑 0790
13	亂 0791	傳 0792	傷 0793	債 0794	催 0795	勢 0796	匯 0797	嗎 0798	圓 0799	園 0800	塊 0801	幹 0802	微 0803	想 0804	意 0805	愛 0806	感 0807	愈 0808	損 0809	敬 0810	
新 0811	會 0812	業 0813	極 0814	歲 0815	滅 0816	準 0817	溫 0818	照 0819	當 0820	經 0821	置 0822	罪 0823	義 0824	羣 0825	著 0826	萬 0827	落 0828	號 0829	裏 0830	裝 0831	補 0832
解 0833	話 0834	該 0835	試 0836	詳 0837	誠 0838	資 0839	路 0840	載 0841	較 0842	農 0843	道 0844	過 0845	運 0846	遇 0847	達 0848	遂 0849	遊 0850	遍 0851	違 0852	鄉 0853	隔 0854
電 0855	零 0856	預 0857	飯 0858	14	像 0859	劃 0860	圖 0861	團 0862	境 0863	奪 0864	實 0865	察 0866	對 0867	態 0868	慢 0869	慣 0870	榮 0871	歉 0872	滿 0873		
漸 0874	演 0875	漲 0876	滬 0877	漢 0878	疑 0879	盡 0880	監 0881	福 0882	種 0883	稱 0884	竭 0885	算 0886	管 0887	精 0888	緊 0889	維 0890	聞 0891	與 0892	蒙 0893	蓋 0894	蓄 0895
製 0896	說 0897	語 0898	認 0899	誤 0900	趕 0901	輕 0902	遠 0903	銀 0904	銅 0905	際 0906	需 0907	領 0908	頗 0909	歷 0910	齊 0911	15	價 0912	增 0913	寫 0914		
審 0915	幣 0916	廠 0917	廢 0918	廣 0919	影 0920	德 0921	慰 0922	慶 0923	撥 0924	數 0925	敵 0926	暫 0927	樂 0928	樣 0929	樓 0930	標 0931	概 0932	歐 0933	潔 0934	熱 0935	熟 0936
確 0937	窮 0938	節 0939	範 0940	編 0941	線 0942	緩 0943	練 0944	罷 0945	複 0946	請 0947	論 0948	誰 0949	談 0950	課 0951	調 0952	諒 0953	賣 0954	質 0955	賜 0956	趣 0957	輪 0958
適 0959	鋪 0960	養 0961	16	勳 0962	器 0963	奮 0964	學 0965	導 0966	憑 0967	戰 0968	據 0969	擇 0970	整 0971	曉 0972	機 0973	樹 0974	橋 0975	橫 0976	歷 0977		
燈 0978	獨 0979	積 0980	糖 0981	縣 0982	與 0983	衛 0984	親 0985	諸 0986	謀 0987	謂 0988	輸 0989	辦 0990	辨 0991	遷 0992	遺 0993	遵 0994	選 0995	錢 0996	錯 0997	鋼 0998	隨 0999
險 1000	靜 1001	頭 1002	餘 1003	17	優 1004	勵 1005	壓 1006	幫 1007	應 1008	懇 1009	戲 1010	擬 1011	濟 1012	營 1013	環 1014	繁 1015	總 1016	聲 1017	聰 1018		
聯 1019	臨 1020	舉 1021	薪 1022	薄 1023	謝 1024	講 1025	購 1026	還 1027	避 1028	闊 1029	雖 1030	館 1031	鮮 1032	點 1033	18	儲 1034	擴 1035	斷 1036	歸 1037		
禮 1038	簡 1039	糧 1040	織 1041	職 1042	舊 1043	藏 1044	謹 1045	轉 1046	醫 1047	雙 1048	離 1049	雜 1050	題 1051	額 1052	19	壞 1053	懷 1054	礙 1055	禱 1056		
藝 1057	藥 1058	識 1059	證 1060	贊 1061	辭 1062	邊 1063	關 1064	難 1065	類 1066	願 1067	20	勸 1068	嚴 1069	寶 1070	籌 1071	繼 1072	覺 1073	警 1074	議 1075		
譯 1076	釋 1077	露 1078	黨 1079	21	屬 1080	攜 1081	續 1082	覽 1083	護 1084	鐵 1085	顧 1086	22	權 1087	歡 1088	聽 1089	讀 1090	鑒 1091				
響 1092	23	變 1093	鑛 1094	顯 1095	驚 1096	驗 1097	體 1098	24	囑 1099	讓 1100	鹽 1101	25	廳 1102	觀 1103	0 0000	1 0001					
2 0002	3 0003	4 0004	5 0005	6 0006	7 0007	8 0008	9 0009	(0040	) 0041	- 0042	: 0043	; 0044	, 0045	. 0046	" 0047	' 0048	/ 0049	? 0052	CL 0057	OK 0058	GA 0059

key board consists of four rows of keys, A, B, C, and D, and a key T, and a spacer S. Paper 2 is held in a tubular holder 4 and along supports 8 and 9. It is fed upwards by line feed wheels 12 and 13. Impressions are made by the hammer 1 striking the paper 2 against the proper type on the horizontal drum 3 of course with an inked ribbon between the paper 2 and the drum 3.

The character types are permanently set on the surface of the cylindrical drum 3 which is divided into 100 circumferential coordinate divisions and 60 axial coordinate divisions. The two coordinates constitute the 6000 unique positions. A selective carriage 15 slides along the axial coordinate and carries the hammer assembly and the paper carriage assembly along with this movement. The selective carriage 15 is normally homed to the extreme left by a spring tension cord 22 and is powered to move to the right by a spring motor 28 which is normally wound up but disengaged from the driver gear 29 by shiftable clutch arrangements 28a and 30. When a key on the A scale and a key on the B scale are depressed in sequence, the selective carriage 15 moves towards the right as the spring motor 28 is engaged until stopped by the selected pin 27 actuated by the selective mechanism 60, 64, 63, 65, 66, and 68. Thus, the proper axial coordinate is selected. The drum 3 is normally homed by a spring tension cord; but is capable of rotation being powered through a driving chain 42 by a spring motor 45 which is normally wound up but is disengaged from the driving shaft 48 by the shiftable mechanisms 46 and 47. When a key on the C scale and a key on the D scale are depressed in sequence, the drum 3 rotates as the motor 45 is

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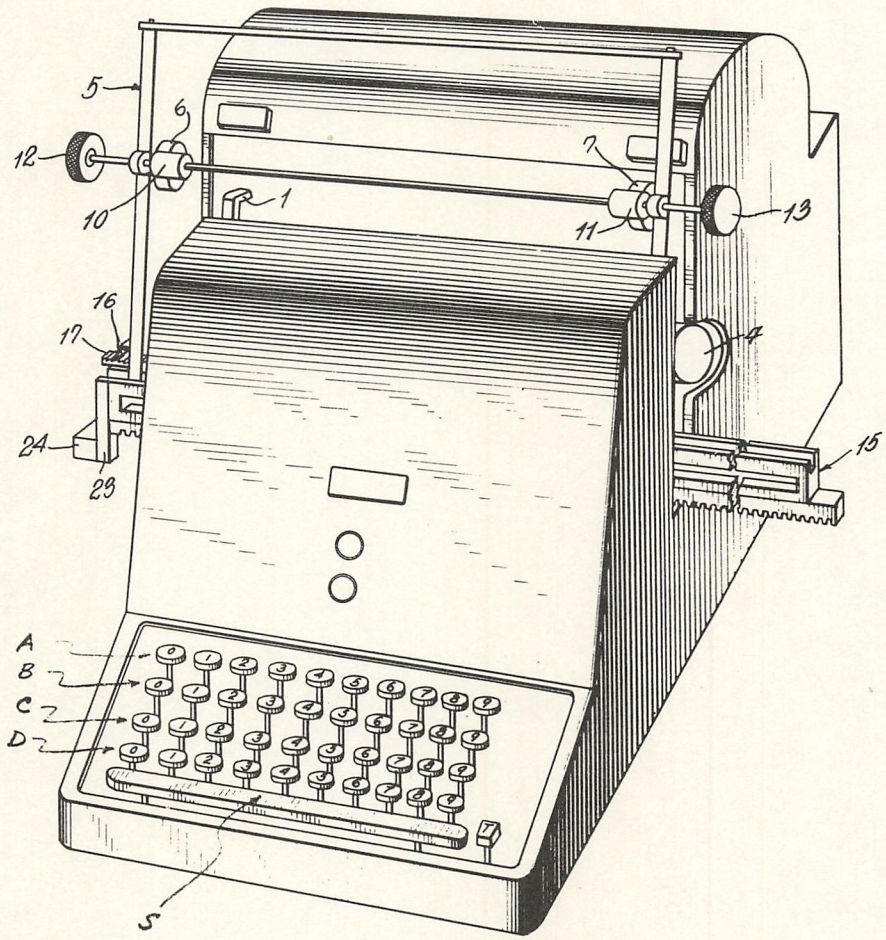
CHINESE LANGUAGE TYPEWRITER AND THE LIKE

Original Filed July 7, 1943 12 Sheets-Sheet 12



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INVENTOR

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Fig. 4

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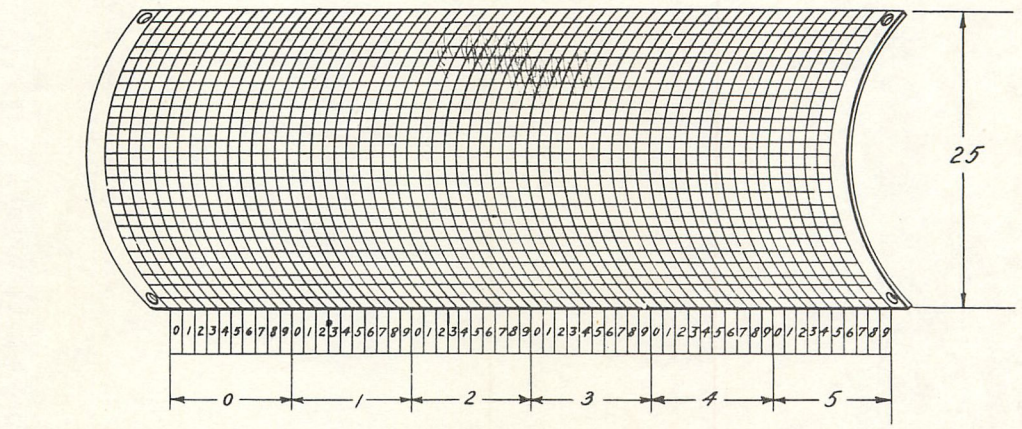
Original Filed July 7, 1943 12 Sheets-Sheet 3



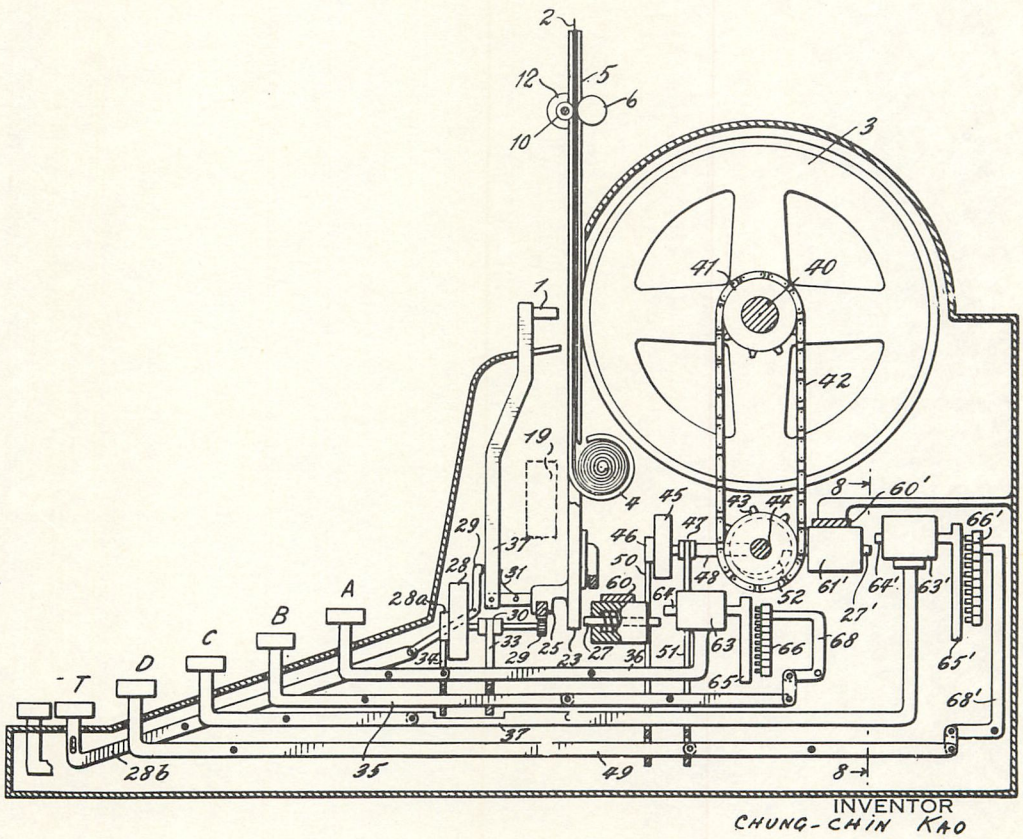


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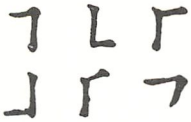
Fig. 5

RULES AND SUPPLEMENTARY RULES

RULE I. Strokes are divided into ten classes, each represented by a figure, as in the following table:

NO.	CLASS	FORMS OF STROKES	EXAMPLES	EXPLANATION
0	Head			Combination of an independent dot with an independent horizontal stroke
1	Horizontal stroke			Including the horizontal, the upward-slanting, and the right-bending strokes.
2	Vertical stroke			Including the vertical, the left-slanting, and the left-bending strokes
3	Dot			Including the dot and the right-slanting stroke
4	Cross			Two strokes intersecting each other
5	Inserted stroke			A stroke passing through two or more strokes
6	Rectangle			A rectangle or square
7	Angle			The place where a horizontal and a vertical stroke meet together
8	Eight			Two strokes opposite each other, forming the shape of the character 八 and its corrupted forms
9	Small			In the shape of the character 小, or some shape similar to it

NOTE. With the exception of Classes 1, 2, and 3, all are compound strokes. For practical use, take as many compound strokes as possible. For instance, 土 is represented by 0, not by 3; 八 by 8, not by 2 and 3, etc.

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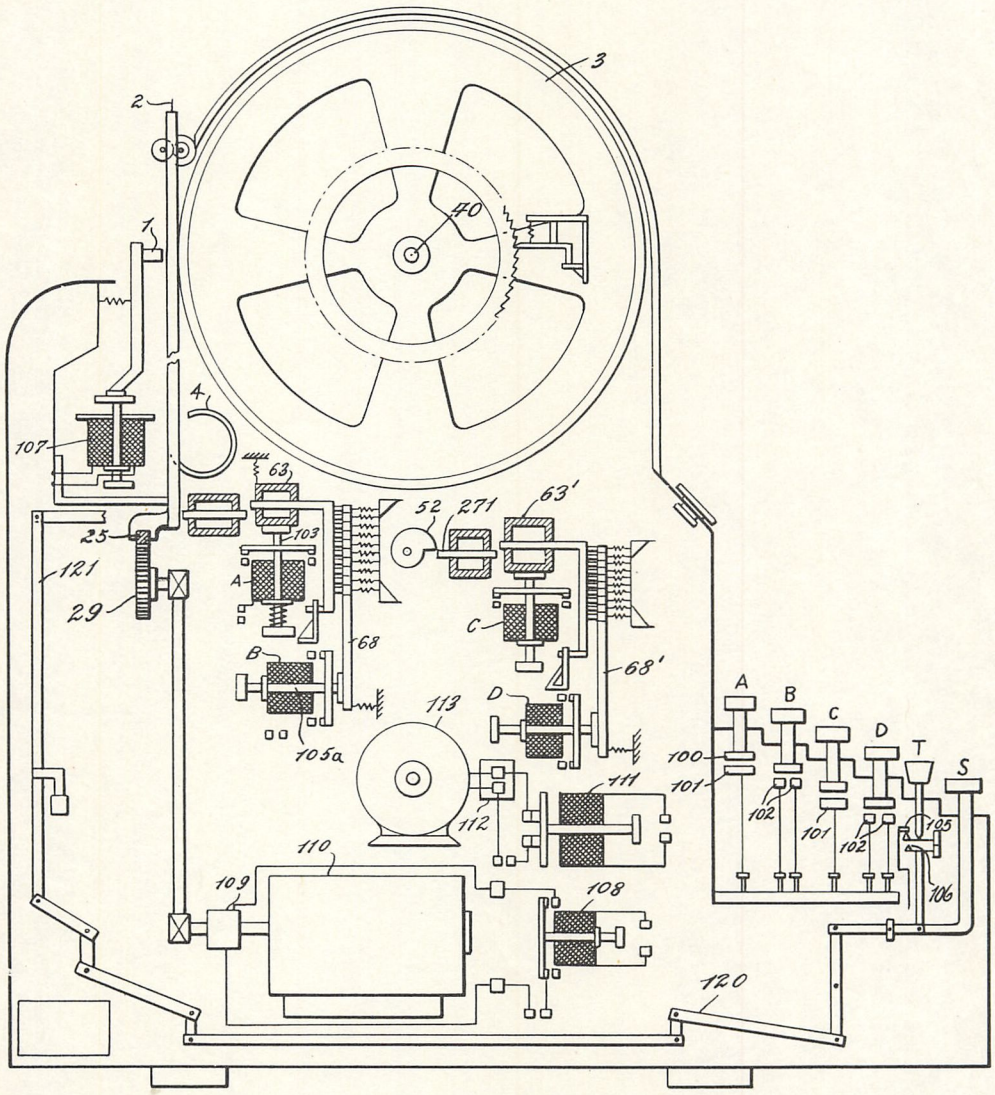

CHUNG-CHIN KAO
INVENTOR

Fig. 7

BY John J. Rogan
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engaged until the selected pin 27', through the selective mechanism 61', 64', 63', 65', 66', and 68', stops the corresponding helical cam 52 on shaft 44. The circumferential coordinate is located. The operations of the selective mechanism are illustrated in Figure 5. The A, B, C, and D keys are of the locking type that stay locked in the depressed position; thus, holding the selected coordinates. The keys must be depressed in the mentioned order; then, key T is depressed. Upon this operation, the hammer 1 is actuated through linkage 29 to 37 to strike against the paper and the drum, thus, making the impression. At the same time, the key T also releases the locked keys and allows the drum 3 and the selective carriage 15 to home and to set the stage for the next operation. As the selective carriage is homed, it trips the toggle link 23d and lowers ratchet bar 17 momentarily, allowing the paper carriage 5 to displace one letter space with respect to the hammer 1 and the selective carriage 15. The paper carriage 5 is capable of this index displacement on the selective carriage 15 by means of a self-winding spring motor 19 and a mechanism common to most typewriters of the English language. Also, a spacer bar S and linkage can index the paper carriage 5 without the necessity of going through the entire process of impression.

The above machine operates entirely on mechanical linkages, detents and spring motors. The machine is also made to operate with simple electric relays and electric motors. A schematic diagram of the electrical version is shown in Figure 7. For further details, bibliography is referred to.

It is to be noted that the typing is done horizontally from left to right. The line being typed is out of sight until the entire line is finished and moved up. Thus, a mistake can not be detected until then.

The inked ribbon can be used only once; therefore, no automatic ribbon reversing mechanism is provided. When the roll of ribbon is finished, the machine is locked from operation until a new ribbon is replaced. Carbon copies are limited to two, in addition to the original. For more copies, a special stencil is used.

Lin Yutang's Ming Kwei Typewriter

Lin noted that the greater part of the Chinese characters could be divided into left-hand components or classifiers and right-hand components or phonetics. These characters might be called simple composite words. He worked out some seventy to eighty classifiers and thirteen hundred right-hand components; from which a great number of characters could be classified. However, many words did not conform to such simple division; rather, their arrangements of components were reversed or more complex. He, thus, developed a classification of characters or their components by referring to configurations of strokes at the top and at the bottom of each character. Examples are given in Table IV.

His method was to print the simple composite words by parts and all others in whole. Whether by parts or in whole, each character or component was coded into classes by the configuration of strokes at the top or top-left in case of doubt and the

configuration of strokes at the bottom or right-bottom. Each class, he worked with in more than eight thousand words, had no more than eight words. This arbitrary system permitted the keyboard to be simplified and to have only thirty-six keys corresponding to the top configurations and twenty-eight keys corresponding to the bottom configurations. Besides those, eight printing keys which were also selecting keys for each class were used. For selecting words from each class a visual selecting device was provided. The operator then noted the number of the desired word in the class and depressed the printing key corresponding to that number. The keyboard is shown in Figure 8.

For simple composite words, the left-hand classifier is to be printed first. A key corresponding to the top configuration of this classifier is depressed; in response to this operation, classifiers having the same configuration are shown in the visual selecting device. The number of duplications to be expected is shown on the keys 12 to 47 in Figure 8. A printing key corresponding to the desired classifier after the visual selection by the operator is depressed to effect the impression. Upon the operation of only two keys, the paper carriage does not index, inasmuch as the character will not be completed until the right-hand component is printed adjacent to the left-hand classifier. The operation to print the right-hand component follows. A key for the top configuration and a key corresponding to the bottom configuration of the right-hand component are depressed in succession; in response to this operation, words in this class are shown in the visual selecting device. A key corresponding

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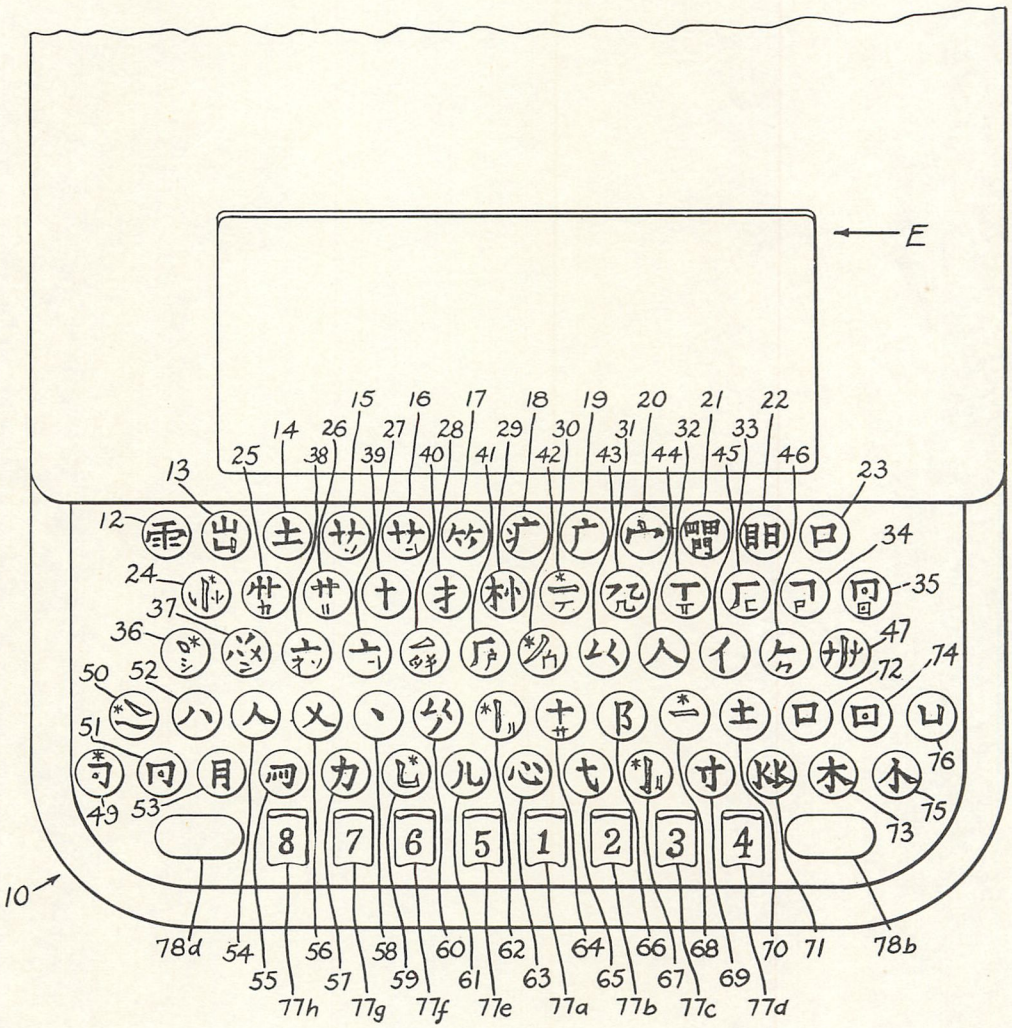

Fig. 8

INVENTOR.
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to the desired word in the class is depressed to effect the impression, and at the same time to cause the paper to index. To achieve the effect of coherence and integration of the two components, the invention arranges it so that the left-hand component will occupy approximately two-fifths of the square and the right-hand component will occupy the other three-fifths. At times, overlapping between the two components is made to achieve the same effect.

For the whole characters, procedures of depressing three keys as in the case of the right-hand component of a simple composite word are followed.

A picture of the typewriter is shown in Figure 9. The type-bearing drum C is shown in details in Figure 10. It comprises six cylindrical units I to VI and each unit has six octagonal type bars. These correspond to the thirty-six keys 12 to 47 in Figure 8. Each octagonal type bar may contain twenty-nine type rings axially. The middle rings contain the seventy to eighty classifiers while the other twenty-eight rings correspond to the twenty-eight keys 50 to 76 in Figure 8. Each of the latter rings has eight types on the circumference of the bar; these types correspond to the eight printing keys 77a to 77b in Figure 8. The combination of twenty-nine rings and the six type bars of each unit provides 8352 spaces for types. Each key for top configuration locates the correct unit by stops on the cam member 127 in Figure 10 and the correct type bar by stops on the cam member 113 and the connected pinion gear such as 115. Each key for bottom configuration locates the correct ring by letting

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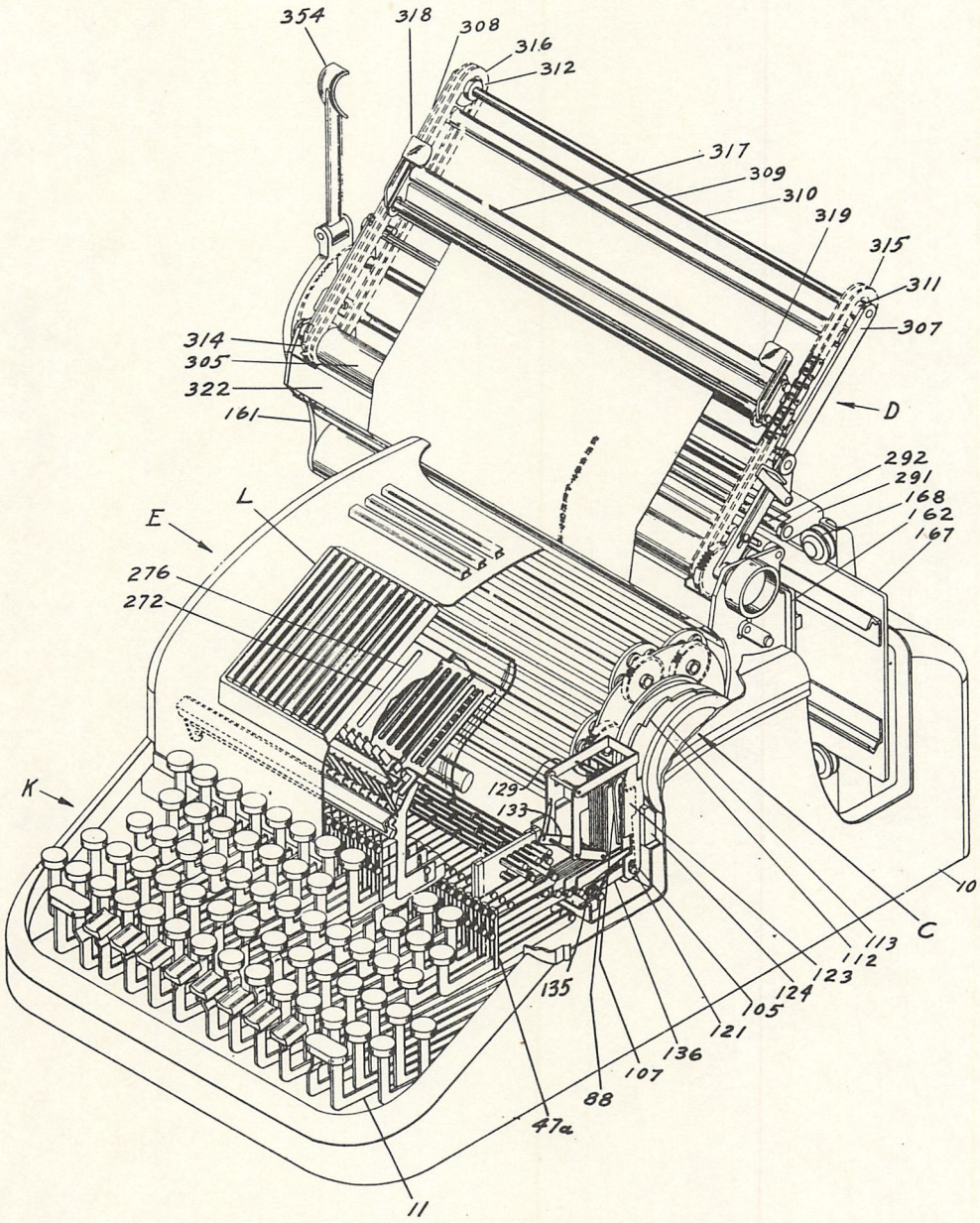

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Fig. 9

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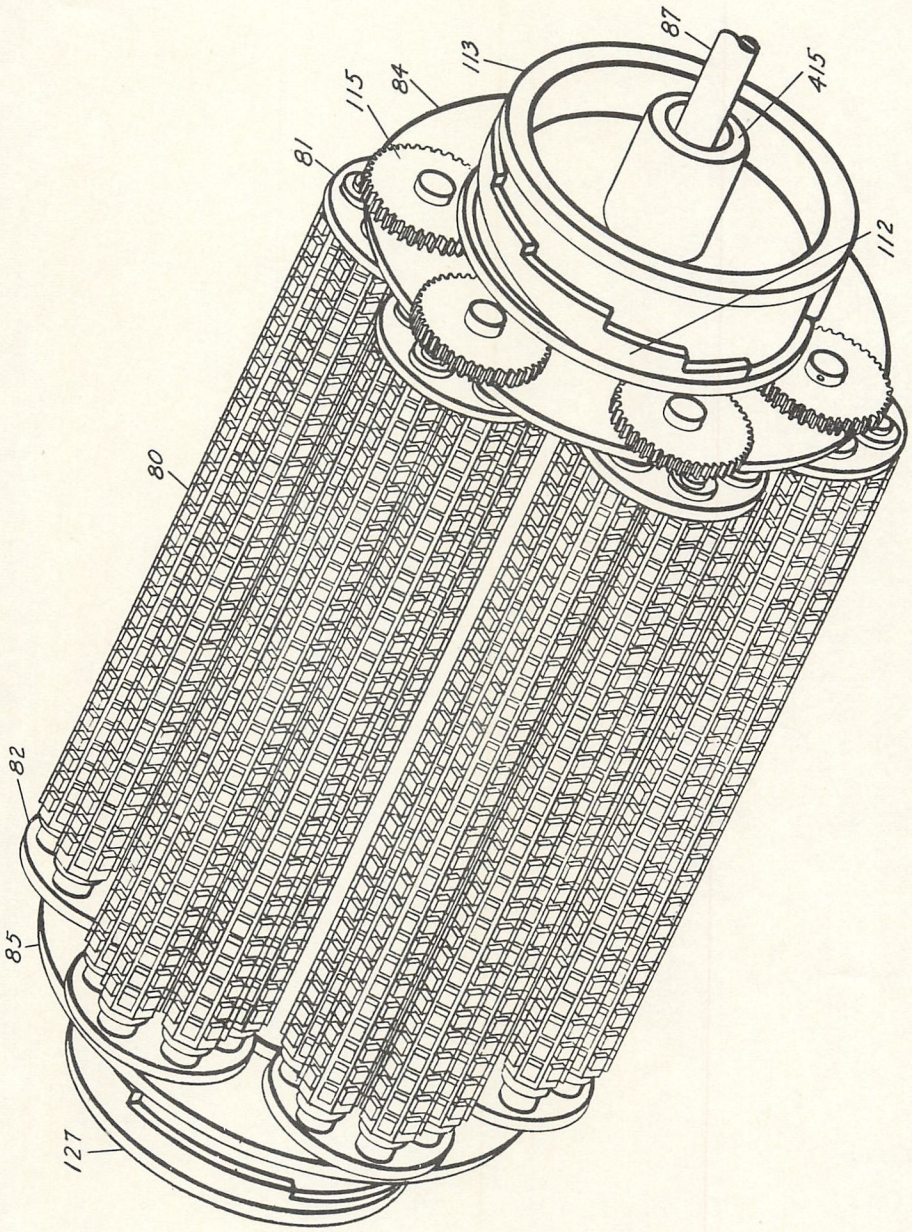

Fig. 10

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the paper carriage D move sidewise along the axial direction of the drum C and stopping it at a location opposite to the correct ring. A printing or selecting key rotates the type bar to the correct type on the circumference. The paper carriage normally homes in the middle opposite the rings for the classifiers. Thus, if only one of the keys from 12 to 47 and one of the eight printing keys are depressed, a classifier is impressed and the indexing mechanism is not actuated.

Power is supplied by an electric motor or spring-motor. The supply linkage system is shown in Figure 11. The motor 400 runs continuously and power is transmitted from 401 to 402 to shaft 282. The multiple epicyclic gear train enables sprockets 406 and 408 to rotate freely relative to the shaft 282 or to be driven by the latter. Sprocket 406 drives the drum by shaft 87 and the cam member 113 by sleeve 415. Sprocket 408 drives a braking or slip-clutch device 418. The clutch in turn drives bevel gears 225 and 226 which is connected to the carriage drive chain 222. Thus, in operation, shaft 282 is driven continuously, with the result that the sprockets 406 and 408 tend to be driven. However, when the shaft 87 and the sleeve 415 are restrained against rotation, the drive must take place to the clutch 418. Then the chain 222 is restrained, the power of the motor dissipated through the braking mechanism of the clutch 418.

For other details of construction refer to the bibliography.

An improved selecting device includes a dummy drum on which all the characters of the original drum C are imbedded and an optical magnifying mechanism. Details of its construction are to be referred to bibliography.

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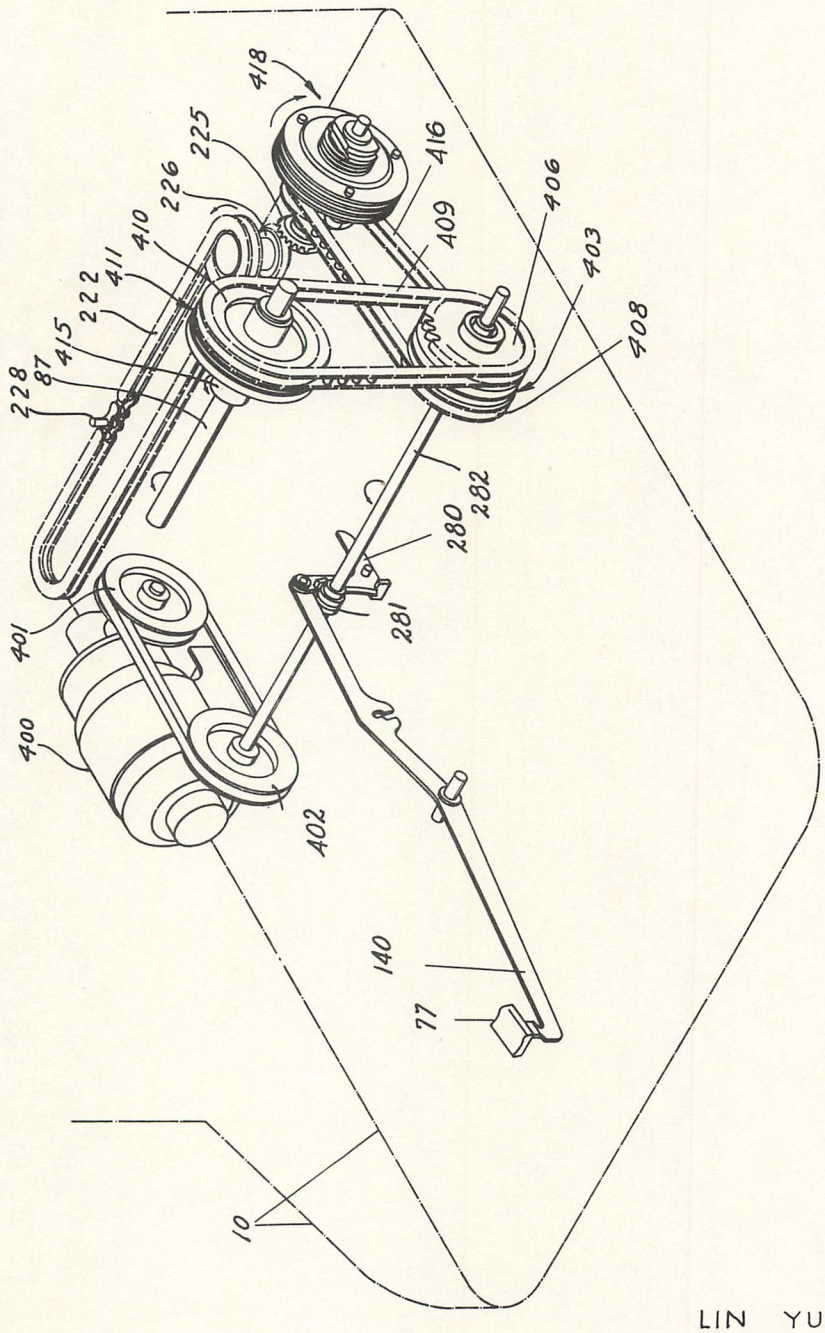

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Fig. 11

This typewriter is the latest disclosure to date. Although its construction is the most complex, it is capable of typing more words than any other before and at reasonably high speed. The most important development is the new system of coding or classifying a large number of characters. The extension of this system to the design of a type-setting machine is a good possibility.

Since visual selection is necessary, speed is limited as compared to the possibility of touch-typing as in the case of the English language typewriters. Also, when words are impressed both by parts and in whole, uniformity of sizes of words typed is not satisfactorily obtained by the present machine.

For the purpose of designing a Chinese typewriter and the like, a coding system must be decided upon; which is best based on the physical appearance of each character so that the operator needs only to observe and to deduce the code with a minimum of mental effort. Lin's method and the Four-corner system were the best attempts along this direction. Another logical coding method is a stroke sequence system or a derivative thereof.

It seems that for the minimum amount of commonly used characters five digits or keys should be sufficient to describe each word without duplication. Readers must be reminded that many Chinese scholars have tried without much success to devise an improved system for the entire language. Since the problem on hand is limited to only a few thousand of the commonly used words, one of the above systems may be employed directly.

Combination of one or more of these systems may be possible; however, attempts to devise an entirely new system such as Lin did may be futile.

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